

## PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

## Process for the production of Flexible Elastic Sheets

We, METALLGESELLSCHAFT AKTIEN-  
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many, a body corporate organised under  
the laws of Germany, do hereby declare  
the invention, for which we pray that a  
patent may be granted to us, and the  
method by which it is to be performed,  
to be particularly described in and by the  
following statement:—

This invention relates to a process for  
the production of flexible elastic sheets  
from a wide mesh knitted fabric.

It is known to obtain products, which in  
many respects have the characteristics of  
rubber sheets, by impregnating or coat-  
ing fabrics or fleeces with rubber latex  
mixes, but such products have not the  
flexibility elasticity and softness of rubber  
sheets. It is moreover known to coat  
knitted goods with a rubber layer by dip-  
ping the same in a slightly foamed rubber  
latex mix. Although in this latter pro-  
cess, elastic products having fine pores  
are obtained, which simulate the char-  
acter of coated materials nevertheless the  
surface is relatively rough and the rubber  
coating can be more or less easily  
separated from the fabric.

It is also known to produce rubber  
plates by dipping glass or metal plates  
batchwise into a rubber latex mix. If in  
this process it is desired to produce  
thicker sheets by the employment of  
coagulating dipping methods, it is diffi-  
cult to prevent the coagulating layer  
from slipping off the smooth dipping  
plate.

It has also been proposed to produce  
rubber sheets by pouring a heat-sensitive  
rubber latex mix on to a plane base and  
heating the latter. Still a further process  
consists in pouring a rubber latex mix on  
to a porous plate, for example of gypsum,  
which solidifies the rubber latex mix by  
absorption of water therefrom. In both  
the last mentioned processes it is difficult  
to obtain sheets of uniform and accurate

dimensions. The process employing  
gypsum is also unsuitable for continuous  
operation.

The present invention aims at provid-  
ing a process which enables flexible and  
stretchable sheets having a uniform thick-  
ness and a smooth surface to be produced  
continuously or intermittently in a simple  
and cheap manner from a wide mesh  
knitted fabric and an elastomer.

To this end, the present invention pro-  
vides a process for the production of  
flexible elastic sheets by the deposition of  
natural rubber or high polymers having  
rubber-elastic properties upon a wide  
mesh knitted fabric, which comprises  
coating or impregnating said wide mesh  
fabric with a coagulating agent, dipping  
the thus coated or impregnated fabric in  
a stretched condition into a dispersion of  
natural rubber or high polymer having  
rubber-elastic properties, and thereupon  
removing said fabric from said dispersion  
and drying the partially or wholly  
coagulated layer covering the meshes of  
said fabric and if desired vulcanising the  
same.

Depending on the concentration of the  
coagulating solution employed and on the  
time the material remains in the dipping  
bath, it is possible to obtain sheets of  
greater or less thickness as desired, which  
sheets are dried and if desired, vulcanised.

The flexible elastic sheets produced by  
the hereindescribed process and especially  
when produced in a continuous operation,  
are of uniform thickness and homogeneous  
consistency. They have a smooth surface,  
which in the case of thinner layers of  
rubber or high polymer, indicate in relief  
the threads of the wide mesh knitted  
fabric, and thus exhibit a distinct pat-  
tern. Thicker layers are completely uni-  
form and smooth. A special advantage  
resides in the flexibility and the tear-  
resistance of the sheets which are rein-  
forced by the thread mesh of the knitted  
fabric, especially when fabrics of high

[Price

tearing resistance made from polyamide yarn are employed.

If the sheets are dried and if desired vulcanised in a stretched condition, they retain their original shape and no shrinkages occur in the length and breadth. The sheets are completely resistant to boiling in water. Even when employing a polyamide fibre fabric which, as is known, is not resistant to boiling, no deformation of the sheet is detectable after boiling for three hours. By the employment of wide mesh knitted fabric the sheets of the present invention can be easily sewn into clothing or laundry without tearing as is the case with rubber sheets not reinforced by fabric. The sheets produced by the hereindescribed process can, for example, be widely employed in the textile industry in combination with other fabrics, for example for the production of brassières, underwear, dress-preservers or elastic bandages, moreover they can be employed for the production of packings and as insulating materials.

In some cases, for example in the brassière industry, it is desirable to employ perforated sheets to permit the skin to breathe. A simple modification of the hereindescribed process enables such sheets to be produced in a simple manner. When the knitwear is removed from the bath of rubber or high polymer the individual threads are coated with a coagulated layer of greater or less thickness, depending on concentration of the coagulant solution and the time the fabric remains in the bath. Non-coagulated liquid lamellæ still remain between the meshes of the knitwear after removal from the bath provided the knitwear does not remain too long in the bath. The coated material before drying is next passed beneath one or more nozzles directing a current of compressed air against a part or the whole of the coated structure with the result that certain liquid lamellæ produced between the meshes of the knitwear are caused to disrupt and thus wide mesh sheets are obtained which are stretchable in all directions and which are provided with perforations variable within wide limits.

According to one embodiment of the invention sharply defined currents of compressed air are directed against the dipped structure. By this means the still liquid lamellæ between the meshes are disrupted over limited surfaces and sharply defined perforated strips are produced lying in the direction of movement of the sheets. The thus produced sheets, while maintaining their rigidity, are sufficiently permeable for breathing. By periodically interrupting the air currents, it is also

possible to obtain sheets having only isolated perforations. The limits between the impermeable and the perforated zones can be sharply defined if the dipped fabric is blown against a template toothed like a comb, the spaces between the teeth of which correspond to the permeable strips.

When using the sheets produced in accordance with the invention for example in the manufacture of brassières, underclothes, and similar articles which come into direct contact with the human skin, it is desirable for hygienic reasons to cover the sheets with lengths of fabric which must in such case be stretchable in at least one direction. Advantageously, this stretchable knitted fabric or knitwear is provided in known manner with a porous elastic coating for example by spraying the same with a natural or synthetic rubber latex which contains a vulcanising agent or which has been prevulcanised, in such manner that the spray does not form a continuous layer on the fabric. The thus pre-treated knitted fabric is then adhered with its layered side either on one or both sides of the sheets according to the invention, prior to the complete drying of the rubber or high polymer, for example by rolling between rollers. In such cases both the porous coating of the fabric which may be non-vulcanised or prevulcanised and the sheets must be employed in a wet state since if the coating were fully vulcanised and dry it would not have a sufficient bonding strength.

Another embodiment of the invention consists in coating the sheets in known manner, on one or both sides with fibre dust prior to the complete drying of the rubber or high polymer in order to impart a velvety appearance thereto. The sheets coated or veloured in accordance with the invention have the stretch and elasticity of the known fabrics produced from spun rubber threads but have a softer and smoother surface than the latter.

The term "high polymer having rubber-elastic properties" used herein is intended to include not only natural vegetable resins such as gutta percha and balata, but also synthetic rubber-like substances, such as mixed polymers of butadiene and styrene and of butadiene and acrylonitrile and polychloroprene.

The invention will be illustrated by the following Examples:—

#### EXAMPLE 1.

A knitted fabric of polyamide fibre of a mesh width of about 2 mm. is stretched on an aluminium frame and dipped into a 55% by weight aqueous solution of calcium nitrate. Immediately after the

removal of the frame from this bath it is dipped into a mix of the following composition by weight:—

- 165 parts of 60% solids content rubber latex.  
 0.8 parts of zinc oxide  
 1.5 parts of sulphur; and  
 0.75 parts of zinc ethylphenyl-dithiocarbamate.
- 10 The frame is allowed to remain for three minutes in the latex mix and is thereupon slowly drawn out at a uniform rate. A uniform and smooth layer of coagulum of a thickness of about 1.8 mm. has been deposited on the fabric. The sheet thus produced is dried in a tensioned state at a temperature of between 70 and 80° C. and vulcanised for about 25 minutes in a drying cabinet heated to 110° C. The sheet is impervious to gases and liquids.

#### EXAMPLE 2.

The continuous production of sheets in accordance with the present invention is illustrated diagrammatically and by way of example with reference to the accompanying drawings in which:—

Fig. 1 illustrates schematically the course of the process;

Fig. 2 is an elevation of a compressed air nozzle transverse to the flow;

Fig. 3 is an elevation of an arcuate perforated template with comb-like teeth; Fig. 4 is a plan of Fig. 3; and

Fig. 5 illustrates the finished product. A knitted cotton fabric of a mesh of about 2 mm. is held under a uniform tension until the finished product is dried in all the hereinafter described operations by tentering bands or rollers provided with tenterhooks.

The fabric passes from a supply roll 1 over a roller and enters a bath 2 containing a coagulant solution consisting of a 30% by weight solution of calcium chloride in a mixture of equal parts of water and a methyl alcohol. On leaving the bath, liquid lamellæ are found between the meshes which are burst by an air current issuing from a nozzle 3 having an elongated slit (Fig. 2). The displaced coagulant solution is collected in a container 4.

The fabric now enters a bath 5 which contains a prevulcanised rubber latex known under the Registered Trade Mark "Revultex". The duration of stay in the bath 5 amounts to about 2 minutes. The fabric leaves the bath over an arcuate template 6 which as shown in Fig. 4 has comb-like teeth. Immediately above each space between adjacent teeth is a nozzle the arrangement of which can be seen from Fig. 3.

Under the above described conditions only the individual threads of the fabric are covered by a layer of coagulated latex whereas lamellæ of uncoagulated prevulcanised latex are located between the meshes. By virtue of the compressed air issuing from the nozzle over sharply defined areas, the non-coagulated portions between the meshes of the fabric are expelled and collected in a container 8. Thus sharply limited grid-like strips Fig. 5 corresponding to the width of the intervals between the teeth of the plate 6 are formed on the rubberised fabric, which strips consists of threads enveloped by rubber whereas along the length of teeth of the plate 6 completely covered strips 12 are formed as shown in Fig. 5. The thus rubberised web is dried in a drier 9.

What we claim is:—

1. In a process for the production of flexible elastic sheets by the deposition of natural rubber or high polymers having rubber-elastic properties upon a wide mesh knitted fabric, the steps which comprise coating or impregnating said wide mesh fabric with a coagulating agent, dipping the thus coated or impregnated fabric in a stretched condition into a dispersion of natural rubber or high polymer having rubber-elastic properties, and thereupon removing said fabric from said dispersion and drying the partially or completely coagulated layer covering the meshes of said fabric and if desired vulcanising the same.

2. Process as claimed in Claim 1, in which on removal from the dipping bath one or more currents of compressed air are directed either on to a part or on to the whole of the dipped wide mesh fabric, before drying.

3. Process as claimed in claim 2, in which sharply defined currents of compressed air are directed against the coated fabric before drying it, said air currents being produced by blowing them through the spaces between adjacent teeth of an arcuate comb-like template supporting the fabric.

4. Process as claimed in claim 3, in which the sharply defined air currents are periodically interrupted.

5. Process as claimed in any of claims 1 to 4, in which one or both sides of the sheets obtained are secured, prior to the complete drying of the rubber or high polymer to the porous elastically coated side of a stretchable knitted fabric the porous coating being obtained in known manner for example, by spraying said fabric with a natural or artificial rubber latex containing vulcanisation agents or a prevulcanised latex, in such a manner

that the spray does not coalesce to form a coherent and continuous layer.

6. Process as claimed in any of claims 1 to 4, in which one or both sides of the sheets obtained are covered with fibre dust prior to the complete drying of the rubber or high polymer.

7. Process for the production of flexible elastic sheets, substantially as described with reference to the foregoing Examples.

8. Stretchable elastic sheets whenever produced by the process claimed in the preceding claims.

Dated this 22nd day of October, 1952.

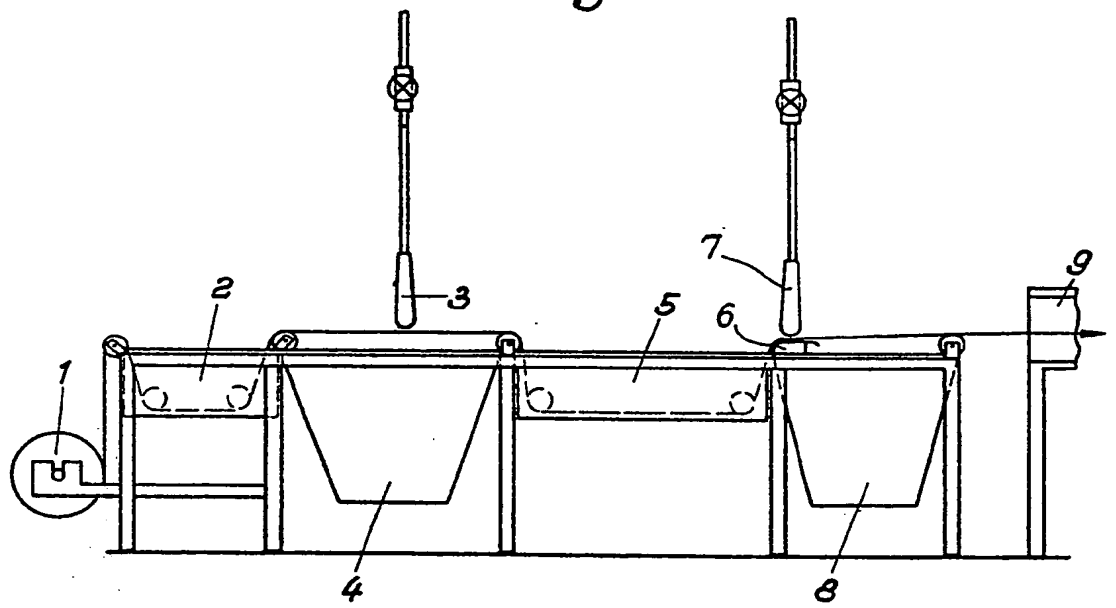
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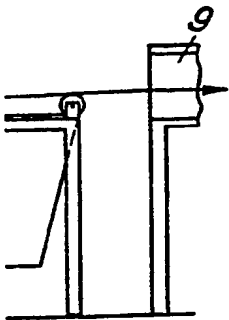
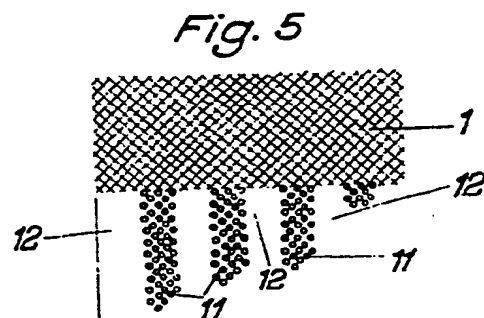
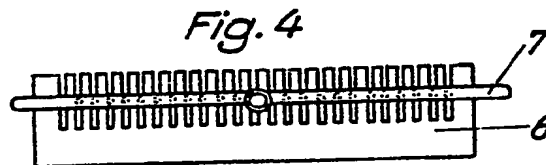
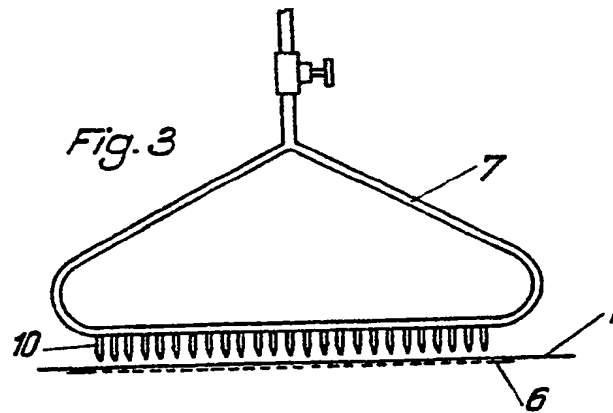
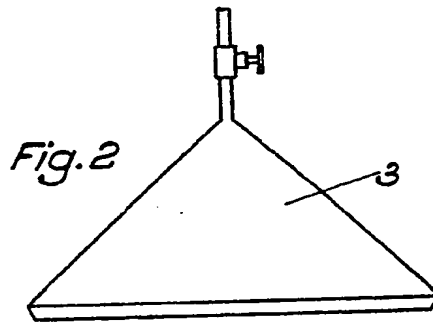
*Fig. 1*

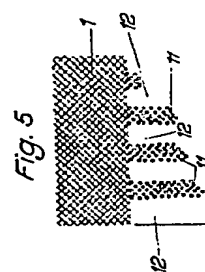
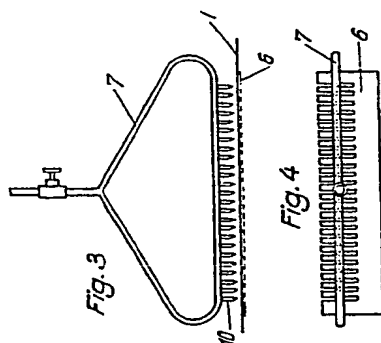
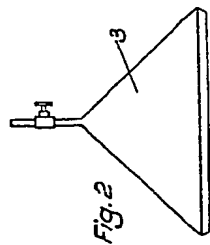
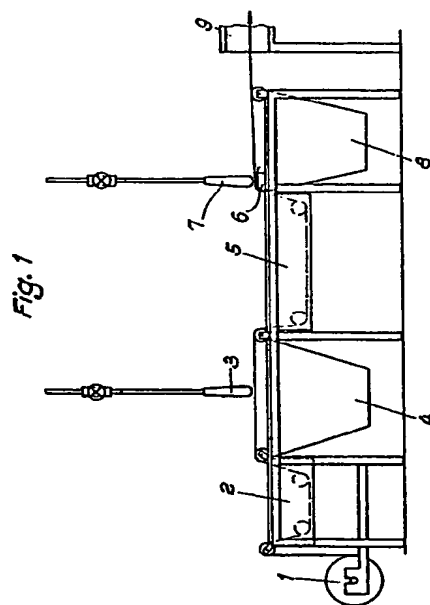


717,103 COMPLETE SPECIFICATION  
2 SHEETS

This drawing is a reproduction of  
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SHEETS 1 & 2





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